



**Euroopa Liit
Euroopa Sotsiaalfond**



Eesti tuleviku heaks

**Toetab TÜ ja TTÜ doktorikool
“Funktsionaalsed materjalid ja tehnoloogiad” (FMTDK)**

ESF projekt 1.2.0401.09-0079

SYNTHESIS OF VERTICALLY ALIGNED CARBON NANOTUBES USING CHEMICALLY PREPARED CATALYST IN THERMAL CHEMICAL VAPOR DEPOSITION PROCESS

E. Šulga, A. Lõhmus, I.Kink.

Institute of Physics, University of Tartu, Estonia

e-mail: jevgenis@fi.tartu.ee

Most common way of achieving long aligned carbon nanotubes (CNTs) is evaporating metal layers on alumina and silicon oxide plane substrates following by a thermal treatment, and chemical vapour deposition (CVD) [1-4]. This procedure requires complicated devices and is quite expensive. In present work vertically aligned CNTs were synthesized on a silicon/silica substrate coated with a salt mixture. The catalytic layer was achieved by spin coating a mixture of cobalt and aluminium salts. The formation of catalytic particles depends on the concentrations and the layer thickness. The growth of CNTs was performed at 700–900 °C using a rapid heating system in a (CVD) chamber. Ethylene was used as the carbon precursor and the mixture of hydrogen and argon was adopted as carrier gas. Long and vertically aligned CNT arrays were obtained under atmospheric pressure. Water vapour was used as a weak oxidizer for removing amorphous carbon and extending functioning of catalyst.

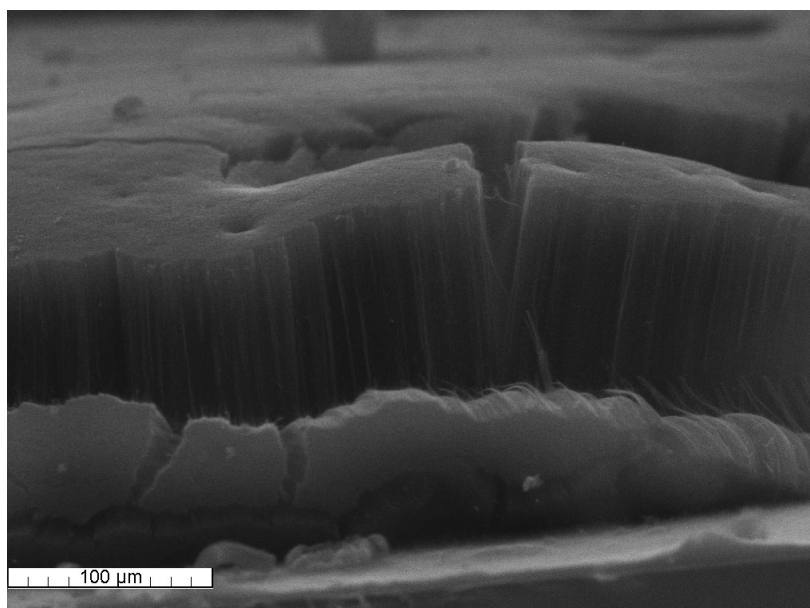


Fig.1. Long vertically aligned carbon nanotubes on a silicon substrate.

References

1. H. Cui, G. Eres, J.Y. Howe, A. Puzos, M. Varela and D.B. Geohegan, *Chem. Phys. Lett.* **374** (2003), p. 222.
2. H.M. Christen, A.A. Puzos, H. Cui, K. Belay and P.H. Fleming, *Nano Lett.* **4** (2004), p. 1939.
3. Y.T. Lee, J. Park, Y.S. Choi, H. Ryu and H.J. Lee, *J. Phys. Chem., B* **106** (2002), p. 7614.
4. D.B. Geohegan, A.A. Puzos, I.N. Ivanov, S. Jesse and G. Eres, *Appl. Phys. Lett.* **83** (2003), p. 1851.